

CLAIMS:

1. A heat resistant coated member comprising a substrate made of a material selected from the group consisting of Mo, Ta, W, Zr, and carbon and a coating of rare earth-containing oxide thereon, the rare earth-containing oxide coating including a surface layer having a hardness of at least 50 HV in Vickers hardness.
2. The coated member of claim 1 wherein the rare earth-containing oxide coating has a surface roughness of up to 20 μm in centerline average roughness Ra.
3. A method for preparing a heat resistant coated member comprising
coating a substrate made of a material selected from the group consisting of Mo, Ta, W, Zr, and carbon with a rare earth-containing oxide, and
heat treating the surface of the coating so that the surface has a hardness of at least 50 HV in Vickers hardness.
4. The method of claim 3 wherein the heat treatment is carried out at 1,200 to 2,500°C.
5. A method of heat treating a powder metallurgical metal, cermet or ceramic material, comprising the steps of placing the material on the heat resistant coated member of claim 1 and heat treating the material thereon.
6. A heat resistant coated member comprising a substrate having a coefficient of linear expansion of at least 4×10^{-6} (1/K) and a layer comprising rare earth-containing oxide coated thereon.

7. The coated member of claim 6 wherein the coating layer comprises at least 80% by weight of a rare earth oxide and the balance of another metal oxide which is mixed, combined or laminated therewith.

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8. A heat resistant coated member comprising a substrate having a coefficient of linear expansion of at least 4×10^{-6} (1/K) and a layer consisting of rare earth oxide coated thereon.

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9. The coated member of claim 6 wherein the rare earth oxide is mainly composed of an oxide of at least one element selected from the group consisting of Dy, Ho, Er, Tm, Yb, Lu, and Gd.

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10. The coated member of claim 6 wherein said coating layer has a thickness of 0.02 mm to 0.4 mm.

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11. The coated member of claim 6 wherein said coating layer has been formed by thermal spraying.

12. The coated member of claim 6 which is used in the sintering of a powder metallurgical metal, cermet or ceramic material in vacuum or an inert or reducing atmosphere.

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13. A heat resistant coated member comprising
a metal, carbon, or carbide, nitride or oxide ceramic substrate,

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an intermediate coating layer on the substrate comprising a lanthanoid oxide, an oxide of Y, Zr, Al or Si, a mixture of these oxides, or a complex oxide of these elements, and

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a coating layer on the intermediate coating layer comprising a complex oxide of a lanthanoid element and a Group 3B element.

14. A heat resistant coated member comprising
a metal, carbon, or carbide, nitride or oxide ceramic
substrate,
an intermediate coating layer on the substrate
5 comprising a lanthanoid oxide, an oxide of Y, Zr, Al or Si, a
mixture of these oxides, or a complex oxide of these
elements, and
a coating layer on the intermediate coating layer
comprising a complex oxide of yttrium, an optional lanthanoid
10 element and a Group 3B element.
15. A heat resistant coated member comprising
a metal, carbon, or carbide, nitride or oxide ceramic
substrate,
15 an intermediate coating layer on the substrate
comprising a metal selected from the group consisting of Mo,
W, Nb, Zr, Ta, Si and B, or a carbide or nitride thereof, and
a coating layer on the intermediate coating layer
comprising a complex oxide of a lanthanoid element and a
20 Group 3B element.
16. A heat resistant coated member comprising
a metal, carbon, or carbide, nitride or oxide ceramic
substrate,
25 an intermediate coating layer on the substrate
comprising a metal selected from the group consisting of Mo,
W, Nb, Zr, Ta, Si and B, or a carbide or nitride thereof, and
a coating layer on the intermediate coating layer
comprising a complex oxide of yttrium, an optional lanthanoid
30 element and a Group 3B element.
17. A heat resistant coated member comprising
a metal, carbon, or carbide, nitride or oxide ceramic
substrate,
35 an intermediate coating layer on the substrate
comprising ZrO_2 , Y_2O_3 , Al_2O_3 or a lanthanoid oxide, a mixture
of these oxides, or a complex oxide of Zr, Y, Al or

lanthanoid element, and a metal selected from the group consisting of Mo, W, Nb, Zr, Ta, Si and B, and

5 a coating layer on the intermediate coating layer comprising a complex oxide of a lanthanoid element and a Group 3B element.

18. A heat resistant coated member comprising a metal, carbon, or carbide, nitride or oxide ceramic substrate,

10 an intermediate coating layer on the substrate comprising ZrO_2 , Y_2O_3 , Al_2O_3 or a lanthanoid oxide, a mixture of these oxides, or a complex oxide of Zr, Y, Al or lanthanoid element, and a metal selected from the group consisting of Mo, W, Nb, Zr, Ta, Si and B, and

15 a coating layer on the intermediate coating layer comprising a complex oxide of yttrium, an optional lanthanoid element and a Group 3B element.

19. The coated member of claim 14 wherein the complex oxide of yttrium and a Group 3B element contains up to 80% by weight of Y_2O_3 and at least 20% by weight of Al_2O_3 .

20. A heat resistant coated member comprising a metal, carbon, or carbide, nitride or oxide ceramic substrate,

25 an intermediate coating layer on the substrate comprising a lanthanoid oxide, an oxide of Y, Zr, Al or Si, a mixture of these oxides, or a complex oxide of these elements, and

30 a coating layer on the intermediate coating layer comprising an oxide of a lanthanoid element, aluminum or yttrium.

21. A heat resistant coated member comprising a metal, carbon, or carbide, nitride or oxide ceramic substrate,

an intermediate coating layer on the substrate comprising a metal selected from the group consisting of Mo, W, Nb, Zr, Ta, Si and B, or a carbide or nitride thereof, and a coating layer on the intermediate coating layer comprising aluminum oxide or a lanthanoid oxide.

22. The coated member of claim 13 wherein said coating layers have a total thickness of 0.02 mm to 0.4 mm.

23. The coated member of claim 13 wherein said coating layers have been thermally sprayed.

24. The coated member of claim 13 which is used in the sintering of a powder metallurgical metal, cermet or ceramic material in vacuum or an inert or reducing atmosphere.

25. The coated member of claim 13 wherein the substrate is made of carbon.

26. A heat resistant coated member comprising a carbon substrate, an interlayer of Yb_2O_3 formed thereon, and a coating layer formed on the interlayer and comprising a complex oxide consisting essentially of up to 80% by weight of Y_2O_3 and at least 20% by weight of Al_2O_3 .

27. A heat resistant coated member comprising a carbon substrate, an interlayer of ZrO_2 formed thereon, and a coating layer formed on the interlayer and comprising a complex oxide consisting essentially of up to 80% by weight of Y_2O_3 and at least 20% by weight of Al_2O_3 .

28. A heat resistant coated member comprising a carbon substrate, an interlayer of ZrO_2 and Y_2O_3 formed thereon, and a coating layer formed on the interlayer and comprising a complex oxide consisting essentially of up to 80% by weight of Y_2O_3 and at least 20% by weight of Al_2O_3 .

29. A heat resistant coated member comprising a carbon substrate, an interlayer of tungsten formed thereon, and a coating layer formed on the interlayer and comprising a complex oxide consisting essentially of up to 80% by weight of Y_2O_3 and at least 20% by weight of Al_2O_3 .